

The opinion in support of the decision being entered today was not written for publication and is not binding precedent of the Board.

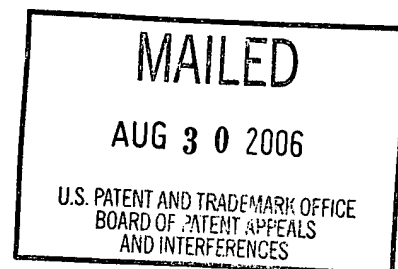
UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte HUITAO LUO

Appeal No. 2006-1618
Application No. 10/046,797

ON BRIEF



Before THOMAS, JERRY SMITH, and BARRY, Administrative Patent Judges.

JERRY SMITH, Administrative Patent Judge.

DECISION ON APPEAL

This is a decision on the appeal under 35 U.S.C. § 134 from the examiner's non-final rejection of claims 1-5, 7-14, and 16-36.¹ Claims 6 and 15 have been indicated to contain allowable subject matter [answer, page 2].

The disclosed invention processes boundary information of a graphical object. Specifically, multiple vertices are determined from the graphical object's boundary information. A predetermined function detects a contour between a

¹ Although this appeal is from the examiner's non-final rejection mailed Dec. 27, 2004, we have jurisdiction over the appeal because the claims have been twice rejected. See 35 U.S.C. § 134. Throughout this opinion, we refer to the examiner's non-final rejection mailed Dec. 27, 2004 (hereafter "non-final rejection").

pair of vertices by analyzing the graphical image. The contour is detected by computing the shortest path between vertices based upon weights generated by the gradient of the underlying image.

Representative claim 1 is reproduced as follows:

A system for processing boundary information of a graphical object, comprising:
code for receiving a graphical image that comprises said graphical object ,
[sic]
wherein said graphical object is defined by at least said boundary information;
code for detecting a plurality of contours between respective pairs of points of said graphical image, wherein individual ones of the contours are detected responsive to respective user input of a user; and
code for determining a plurality of vertices from said boundary information, wherein respective contours, which are between adjacent vertices of said plurality of vertices and are detected by said code for detecting, approximate respective edges of said boundary information within a distortion criterion.

The examiner relies on the following references:

Catros et al. (Catros)	4,843,630	Jun. 27, 1989
Ikezawa et al. (Ikezawa)	5,471,535	Nov. 28, 1995
Kim.	5,774,595	Jun. 30, 1998
Suzuki	5,974,175	Oct. 26, 1999
Kim (Kim '337)	6,055,337	Apr. 25, 2000
Makram-Ebeid et al. (Makram-Ebeid)	6,332,034	Dec. 18, 2001

Huitao Luo & Alexandros Eleftheriadis, Designing an Interactive Tool for Video Object Segmentation and Annotation, Advent Group, Columbia Univ., Jul. 12, 1999 ("Luo").

The following rejections are on appeal before us:

1. Claims 1, 2, 10, 12, 16, 18, 25-27, 29, and 33-36 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Kim in view of Suzuki.

2. Claim 28 stands rejected under 35 U.S.C. § 103(a) as being unpatentable over Kim in view of Suzuki and further in view of Ikezawa.

3. Claims 3-5, 7-9, 13, 14, 17, and 30 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Kim in view of Suzuki and further in view of Catros.

4. Claims 11 and 19 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Kim in view of Suzuki and further in view of Kim ('337).

5. Claims 20-23, 31, and 32 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Catros in view of Makram-Ebeid.

6. Claim 24 stands rejected under 35 U.S.C. § 103(a) as being unpatentable over Catros in view of Makram-Ebeid and further in view of Luo.

Rather than repeat the arguments of appellant or the examiner, we make reference to the briefs and the answer for the respective details thereof.

OPINION

We have carefully considered the subject matter on appeal, the rejections advanced by the examiner and the evidence of obviousness relied upon by the examiner as support for the rejections. We have, likewise, reviewed and taken into consideration, in reaching our decision, the appellant's arguments set forth

in the briefs along with the examiner's rationale in support of the rejections and arguments in rebuttal set forth in the examiner's answer.

It is our view, after consideration of the record before us, that the evidence relied upon and the level of skill in the particular art would have suggested to one of ordinary skill in the art the obviousness of the invention as set forth in the claims on appeal. Accordingly, we affirm.

In rejecting claims under 35 U.S.C. § 103, it is incumbent upon the examiner to establish a factual basis to support the legal conclusion of obviousness. See In re Fine, 837 F.2d 1071, 1073, 5 USPQ2d 1596, 1598 (Fed. Cir. 1988). In so doing, the examiner is expected to make the factual determinations set forth in Graham v. John Deere Co., 383 U.S. 1, 17, 148 USPQ 459, 467 (1966). The examiner must articulate reasons for the examiner's decision. In re Lee, 277 F.3d 1338, 1342, 61 USPQ2d 1430, 1434 (Fed. Cir. 2002). In particular, the examiner must show that there is a teaching, motivation, or suggestion of a motivation to combine references relied on as evidence of obviousness. Id. 277 F.3d at 1343, 61 USPQ2d at 1433-34. The examiner cannot simply reach conclusions based on the examiner's own understanding or experience - or on his or her assessment of what would be basic knowledge or common sense. Rather, the examiner must point to some concrete evidence in the record in support of these findings. In re Zurko, 258 F.3d 1379, 1386, 59 USPQ2d 1693, 1697 (Fed. Cir. 2001). Thus the examiner must not only assure that the requisite findings are made, based on evidence of record, but must also

explain the reasoning by which the findings are deemed to support the examiner's conclusion. However, a suggestion, teaching, or motivation to combine the relevant prior art teachings does not have to be found explicitly in the prior art, as the teaching, motivation, or suggestion may be implicit from the prior art as a whole, rather than expressly stated in the references. The test for an implicit showing is what the combined teachings, knowledge of one of ordinary skill in the art, and the nature of the problem to be solved as a whole would have suggested to those of ordinary skill in the art. In re Kahn, 441 F.3d 977, 987-88, 78 USPQ2d 1329, 1336 (Fed. Cir. 2006) (citing In re Kotzab, 217 F.3d 1365, 1370, 55 USPQ2d 1313, 1316-17 (Fed. Cir. 2000)). See also In re Thrift, 298 F. 3d 1357, 1363, 63 USPQ2d 2002, 2008 (Fed. Cir. 2002). These showings by the examiner are an essential part of complying with the burden of presenting a prima facie case of obviousness. Note In re Oetiker, 977 F.2d 1443, 1445, 24 USPQ2d 1443, 1444 (Fed. Cir. 1992). If that burden is met, the burden then shifts to the applicant to overcome the prima facie case with argument and/or evidence. Obviousness is then determined on the basis of the evidence as a whole and the relative persuasiveness of the arguments. See Id.; In re Hedges, 783 F.2d 1038, 1039, 228 USPQ 685, 686 (Fed. Cir. 1986); In re Piasecki, 745 F.2d 1468, 1472, 223 USPQ 785, 788 (Fed. Cir. 1984); and In re Rinehart, 531 F.2d 1048, 1052, 189 USPQ 143, 147 (CCPA 1976). Only those arguments actually made by appellant have been considered in this decision. Arguments which appellant could have made but chose not to make in the briefs

have not been considered and are deemed to be waived [see 37 CFR § 41.37(c)(1)(vii)(2004)].

We first consider the rejection of claims 1, 2, 10, 12, 16, 18, 25-27, 29, and 33-36 under 35 U.S.C. § 103(a) based on Kim and Suzuki. Regarding independent claims 1 and 33, the examiner's rejection essentially finds that Kim teaches every claimed feature except for detecting individual contours responsive to respective user input [non-final rejection, pages 3 and 4]. The examiner cites Suzuki as disclosing a motion picture apparatus where a user picks points adjacent boundary locations to detect a contour. The examiner finds that it would have been obvious to one of ordinary skill in the art at the time of the invention to modify Kim to respond to user input to specify a portion of an image to separate [non-final rejection, page 4].

Appellant argues that there is no motivation to combine the references. Appellant contends that Kim and Suzuki are directed towards entirely different systems and methods that achieve different results and solutions for different problems [brief, page 6; reply brief, pages 3 and 4]. Specifically, appellant notes that Kim discloses a method of representing a contour of an object for a video signal encoder. Suzuki, however, identifies a contour for extracting an object from an image frame of a motion picture for subsequent editing. According to appellant, modifying Kim to accept user input as taught by Suzuki as asserted by the examiner would not only increase complexity, but also slow Kim's encoding process unacceptably [brief, pages 6 and 7].

Appellant further contends that no reasonable expectation of success exists in combining Kim with Suzuki since slowdowns in Kim's system caused by user intervention would destroy or frustrate Kim's purpose (i.e., encoding entire frames of video) by encoding user-selected objects. Such a modification of Kim, according to appellant, would result in unacceptable encoding speeds [brief, page 10; reply brief page 4].

The examiner responds that Kim and Suzuki are properly combinable since both references detect image contours -- albeit for different purposes [answer, page 4]. The examiner further notes that applying the teachings of Suzuki would not slow Kim's system unacceptably since Suzuki does not require user input in every frame of video; rather, only one user input is required. After such user input, contours are then detected automatically in subsequent frames [answer, pages 4 and 5].

The examiner further notes that the motivation to combine the references was expressly stated in Suzuki, namely so that the user can extract a single object from a sequence of images of a motion picture on the basis of a detected object contour. According to the examiner, without such a user input, Kim's video encoder would be unable to select a single object for extraction [answer, page 5].

We will sustain the examiner's rejection of claim 1. We note at the outset that Kim discloses selecting two starting vertices (A and B) depending on whether the image is an open or closed loop [Kim, col. 3, lines 13-18; Fig. 2A]. Kim does not state that the starting vertices A and B are manually selected, but

rather determined from the approximation technique performed by polygonal approximation block 100 [Kim, col. 3, lines 30-34].

Turning to the secondary reference, Suzuki discloses detecting the contour of an object within a sequence of images where the user specifies points adjacent boundary locations of the object in a first image. Contours of subsequent images are detected based on contour points detected by the first image [Suzuki, abstract, col. 2, lines 1-50]. Based on the record before us, we find that the teachings of Suzuki are reasonably combinable with Kim essentially for the reasons stated by the examiner. Although manually selecting points would arguably slow Kim's encoding process, we disagree with appellant that such manual selection would inevitably frustrate Kim's purpose of encoding video. On the contrary, we see no reason why such manual selection would not be useful and beneficial to Kim's system -- namely to enable the user to precisely dictate and control the entry of vertices corresponding to a particular object, particularly with complex contours. Moreover, we agree with the examiner that applying the teachings of Suzuki would not slow Kim's system unacceptably since Suzuki does not require user input in every frame of video; rather, only one user input is required. After such user input, contours are then detected automatically in subsequent frames as the examiner indicates.

Furthermore, even assuming that the starting vertices in Kim are determined automatically, manually selecting starting vertices would add numerous potential candidates for starting vertices for detecting contours of a

particular image well beyond the two possibilities for initial starting vertices disclosed in Kim. In Kim, only the end points (open loop image) or the farthest points on the contour (closed loop image) are selected as the starting vertices [see Kim, col. 3, lines 13-18]. Manually selecting vertices, however, would yield significantly greater numbers of potential starting vertices and not be limited to only two sets of vertices.

Ultimately, providing user input to Kim's system amounts to a tradeoff between the useful and beneficial features afforded by such user input noted above and efficiency. But such a tradeoff does not preclude the advantages obtained that would be readily apparent to the skilled artisan by applying the teachings of Suzuki to Kim's system as noted above.

Furthermore, we are not persuaded by appellant's argument that the skilled artisan would not reasonably expect success from combining Kim and Suzuki. It is well settled that the prior art can be modified or combined to reject claims as prima facie obvious as long as there is a reasonable expectation of success. In re Merck & Co., Inc., 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986). Although obviousness does not require absolute predictability, at least some degree of predictability is required. Evidence showing there was no reasonable expectation of success may support a conclusion of nonobviousness. In re Rinehart, 531 F.2d 1048, 189 USPQ 143 (CCPA 1976).

We see no reason why the skilled artisan would not reasonably expect success if Suzuki's teachings were combined with Kim in the manner suggested

by the examiner. Furthermore, apart from appellant's arguments, appellant has provided no factual evidence on this record proving otherwise. It is well settled that mere lawyer's arguments and conclusory statements, which are unsupported by factual evidence, are entitled to little probative value. In re Geisler, 116 F.3d 1465, 1470, 43 USPQ2d 1362, 1365 (Fed. Cir. 1997); In re De Blauwe, 736 F.2d 699, 705, 222 USPQ 191, 196 (Fed. Cir. 1984); In re Wood, 582 F.2d 638, 642, 199 USPQ 137, 140 (CCPA 1978); In re Lindner, 457 F.2d 506, 508-09, 173 USPQ 356, 358 (CCPA 1972). In short, the skilled artisan would reasonably expect success if Suzuki and Kim were combined, and the art is predictable. The examiner's obviousness rejection of independent claim 1 is therefore sustained.

We will also sustain the examiner's rejection of independent claim 33. Because we find that it would have been obvious to one of ordinary skill in the art at the time of the invention to provide user input to Kim's system for the reasons noted previously, we likewise hold that it would have been obvious to one of ordinary skill in the art at the time of the invention for the user to input information via a user interface. As the examiner indicates, Suzuki's contour detection system is computer-based [answer, page 8]. In our view, a user interface to input such information to a computer would have been readily apparent to the skilled artisan to facilitate prompt, easy, and accurate data entry. The examiner's obviousness rejection of claim 33 is therefore sustained.

Regarding independent claim 12, the examiner indicates that Kim discloses, among other things, (1) encoding at least the plurality of vertices in a

data structure to represent boundary information, and (2) receiving input of a contour image and transforming the image into a set of quantized transform coefficients and segment data [non-final rejection, page 6]. The examiner then asserts "that format changes in images and videos are very well-known in the art" [non-final rejection, page 7]. The examiner concludes that it would have been obvious to one of ordinary skill in the art at the time of the invention to modify Kim to convert from one format to another to ensure compatibility with various systems [id.].

Appellant notes that the claim recites converting graphical information of a data structure in combination with encoding vertices in the data structure [brief, page 11]. Appellant notes that the quantized transform coefficients and segment data in Kim are not encoded into a data structure that is converted [id.]. Also, appellant disagrees with the examiner's assertion that converting graphical information of the data structure from a first format to a second, different format is well known in the art [id.].

The examiner responds that the term "data structure" is broad and can encompass any method of storing data, including the quantized transform coefficients of Kim [answer, page 7]. According to the examiner, Kim's transform coefficients constitute data to be transmitted and must have some sort of inherent structure; otherwise, the data cannot be read [id.]. The examiner also contends that Kim even meets a second, narrower definition of "data structure"

[id].² Appellant responds that any organization of data may not be fairly considered a "data structure" under the narrower definition since data merely arranged in a file or otherwise made available for communication or processing with no specific ordering or arrangement is not a "data structure for better algorithm efficiency" [reply brief, page 5].

We will sustain the examiner's rejection of claim 12. We agree with the examiner that the scope and breadth of the limitation "data structure" fully reads on the quantized transform coefficients of Kim and that format conversion of graphical information is well known in the art. According to the Microsoft Press Computer Dictionary, "data structure" is defined as follows:

data structure An organizational scheme, such as a record or an array, applied to data so that it can be interpreted and so that specific operations can be performed upon that data.

Microsoft Press Computer Dictionary, 2d ed., Microsoft Press, 1994, at 110.

Although "[d]ictionaries...are often useful to assist in understanding the commonly understood meaning of words[,]...any reliance on dictionaries accords with the intrinsic evidence: the claims themselves, the specification, and the prosecution history." Free Motion Fitness, Inc. v. Cybex Int'l, Inc., 423 F.3d 1343, 1348, 76 USPQ2d 1432, 1436 (Fed. Cir. 2005) (internal citations omitted). The definition of "data structure" above fully comports with the term's usage in

² Under this narrower definition, "data structure" is defined as "[a]n organization of information, usually in memory, for better algorithm efficiency, such as queue, stack, linked list, heap, dictionary, and tree, or conceptual unity, such as the name and address of a person. It may include redundant information, such as length of the list of number of nodes in a subtree" [answer, page 7].

the specification. For example, the instant specification states that "[i]n Step 804, post-processing and node editing of the closed boundary may be performed utilizing additional user interaction. In Step 805, an object description data structure (e.g. boundary definition, support map, and/or the like) is created to define the object selected by the user" [see specification, Para. 0068; Fig. 8]. See also brief, page 2 (noting that exemplary data structures are described at Step 804 of Fig. 8). Such a data structure can reasonably be considered an organizational scheme applied to data so that it can be interpreted and operations performed thereon and is therefore consistent with the definition above.

Turning to the prior art, Kim stores vertex information in buffer 110. After storing all vertices in buffer 110, the contour approximation process commences. In this process, buffer 110 provides segment data representing the positions of the two vertices of a given line segment to sampling circuit 115 [Kim, col. 3, lines 35-45; Fig. 1].

We find that Kim's storage of vertex information in the buffer fully meets a "data structure" as claimed and fully comports with the definition cited above. That is, the stored vertex information in Kim reasonably constitutes an organizational scheme applied to the data so that it can be interpreted and operations performed thereon, particularly since that same information is interpreted and utilized subsequently in a contour approximation algorithm. Furthermore, we find that the buffer's providing segment data representing the

positions of two stored vertices of a particular line segment responsive to an initiation signal reasonably constitutes a conversion of the graphical information of the data structure from one format (i.e., stored vertex information) to another format (i.e., segment data) as claimed.

We agree with the examiner that converting graphical information from one format to another is well known in the art to ensure compatibility with various systems, particularly video and graphics applications. In our view, it would have been obvious to one of ordinary skill in the art at the time of the invention to convert the stored vertex data string in Kim for compatibility with diverse graphical systems.

Furthermore, we agree with the examiner that Kim's transform coefficients reasonably constitute a "data structure" as claimed particularly since such transform coefficients fully comport with the definition above. In our view, the transform coefficients reasonably constitute an organizational scheme applied to the data so that it can be interpreted and operations performed thereon. Accordingly, the examiner's rejection of claim 12 is sustained.

Regarding dependent claims 25, 29, and 34, the examiner indicates that because Suzuki takes user input each time a contour is detected, a different contour would require a different input [non-final rejection, pages 7 and 8]. Appellant responds that the claimed limitation does not necessarily flow from the references. Appellant notes that such a feature is not inherent to Suzuki because detection of contours of subsequent images is based upon contour

points detected by the first contour unit. Therefore, according to appellant, operations of the second detection unit do not "take user input each time a contour is detected" as the examiner alleges [brief, page 13]. The examiner responds that if the invention of Suzuki were restarted, a second contour would be selected with different user input [answer, page 9].

We will sustain the examiner's rejection of claims 25, 29, and 34. The scope and breadth of the claim language does not preclude the collective teachings of Kim and Suzuki. Certainly, when a user manually selects a different contour (e.g., when Suzuki's invention is restarted), the user input would be different for that contour. In that case, the user input would be different for individual ones of the contours (i.e., multiple contour selections). The rejection is proper and therefore sustained.

Regarding dependent claim 35, the examiner indicates that Suzuki discloses extracting the graphical information defined by boundary information from the image [non-final rejection, page 8]. Appellant argues that no motivation exists to combine the references since Kim is concerned with data compression including previously-defined contours and encoding entire frames. Kim, however, is not concerned with extracting graphical information defined by boundary information from the image as claimed [brief, page 15; reply brief, page 8]. The examiner responds that the combination is proper since Kim pertains to fitting and encoding contours in addition to compressing data [answer, pages 11 and 12].

We will sustain the examiner's rejection of claim 35. As the examiner indicates, although Kim does not disclose extracting contour information, Suzuki amply teaches such extraction for image manipulation and editing [Suzuki, col. 1, lines 10-24]. As we noted previously, the references are reasonably combinable and our rationale is also applicable here. See Pages 8-10, supra, of this opinion. The examiner's rejection of claim 35 is reasonable and therefore sustained.

Since appellant has not separately argued the patentability of dependent claims 2, 10, 16, 18, 26, 27, and 36, these claims fall with independent claims 1, 12, and 33. See In re Nielson, 816 F.2d 1567, 1572, 2 USPQ2d 1525, 1528 (Fed. Cir. 1987). See also 37 CFR § 41.37(c)(vii).

We next consider the examiner's rejection of claim 28 under 35 U.S.C. § 103(a) as being unpatentable over Kim in view of Suzuki and further in view of Ikezawa. The examiner essentially finds that the claim differs from the teachings of Kim and Suzuki in calling for the user input to select, for individual ones of the contours, at least one of the respective vertices and width of an area of the graphical image [non-final rejection, pages 8 and 9]. The examiner cites Ikezawa as disclosing a system where the user can select vertices and the width of an area [id.]. The examiner then finds that it would have been obvious to one of ordinary skill in the art at the time of the invention to allow the user to specify vertices of a contour and width of a contour area to account for complicated contours [id.].

Appellant argues that there is no motivation to combine the references [brief, page 14]. Specifically, appellant argues that no objective evidence exists establishing that Kim or Suzuki suffer from an inability to process complicated shapes to motivate one to look to teachings of other references [id.]. The examiner responds that Ikezawa expressly provides such a motivation -- namely to better process complicated images by allowing user editing [answer, pages 9 and 10].

We will sustain the examiner's rejection of claim 28. As the examiner indicates, Ikezawa discloses a contour detection method that enables the user to designate a rectangular range (i.e., the height and width) of a given area for contours with complicated shapes [Ikezawa, col. 11, lines 60-66]. We find that this teaching is reasonably combinable with Kim and Suzuki essentially for the reasons stated by the examiner. Certainly, complex contours are detected in Kim and Suzuki, and we see no reason why such complex contour detection would not benefit from the user-definable input feature of Ikezawa. The examiner's combination of Ikezawa with Kim and Suzuki is therefore proper and the rejection is therefore sustained.

We next consider the examiner's rejection of claims 3-5, 7-9, 13, 14, 17, and 30 under 35 U.S.C. § 103(a) as being unpatentable over Kim in view of Suzuki and further in view of Catros. Regarding claim 3, the examiner finds that the claim differs from Kim and Suzuki in calling for using a predetermined function operable to calculate gradients. The examiner cites Catros as teaching

using data representing grey levels of the image of the amplitudes and/or orientations of the gradients as starting data to elaborate image contours [answer, page 9]. The examiner then finds that it would have been obvious to one of ordinary skill in the art at the time of the invention to use gradient values for contour detection in Kim and Suzuki to better represent contours [answer, page 10]. Regarding claim 4, the examiner further notes that Catros also uses amplitude values as weights and reduces the contour detection problem to a "shortest path" problem.

Appellant responds that no motivation exists to combine the references [brief, page 14]. Specifically, appellant argues that the skilled artisan concerned with video encoding of known complete boundary image data in Kim would not be motivated to look to disparate teachings of Catros regarding bridging disjointed contour elements [id.]. The examiner responds by noting, among other things, that if Kim's invention were used on an image that contained missing contours, the skilled artisan would reasonably refer to the teachings of Catros for a solution to fill in the missing contours [answer, pages 10 and 11]. Appellant responds that combining Catros with Kim and Suzuki in the manner suggested by the examiner is improper since, among other things, neither Kim nor Suzuki is concerned with such discontinuities [reply brief, page 7].

We will sustain the examiner's rejection of claims 3 and 4. We find that the teachings of Catros are reasonably combinable with Kim and Suzuki essentially for the reasons stated by the examiner. Indeed, any two adjacent

vertices (points) in the contour detection systems disclosed in Kim and Suzuki are essentially "disjointed contour elements" that are "bridged" by detecting a contour between the points. We see no reason why the skilled artisan would not reasonably refer to the teachings of Catros for a method to connect such adjacent "discontinuities" (i.e., points) together by the shortest path that accounts for image gradient information. The examiner's combination of Catros with Kim and Suzuki is reasonable; the rejection of claims 3 and 4 is therefore sustained.

Likewise, we will sustain the examiner's rejection of dependent claims 5, 7-9, 13, 14, 17, and 30 under 35 U.S.C. § 103(a) as being unpatentable over the teachings of Kim in view of the teachings of Suzuki and Catros. We find that (1) the examiner has established at least a prima facie case of obviousness for these claims on pages 9-13 of the non-final rejection, and (2) appellant has not persuasively rebutted the examiner's prima facie case. The rejection is therefore sustained.

We next consider the examiner's rejection of claims 20-23, 31, and 32 under 35 U.S.C. § 103(a) as being unpatentable over Catros in view of Makram-Ebeid. Regarding independent claim 20, the examiner finds that Catros discloses essentially all of the claimed subject matter except for (1) regions defined by a scale parameter, and (2) contours associated with a scale parameter [non-final rejection, page 17]. The examiner cites Makram-Ebeid as teaching a method of merging regions where each region and contour is associated with a certain scale parameter [non-final rejection, page 18]. The

examiner concludes that, in view of Makram-Ebeid, it would have been obvious to one of ordinary skill in the art at the time of the invention to modify Catros to include a scale parameter to merge similar adjacent regions to aid in correctly identifying contours [id.].

Appellant argues that there is no motivation to combine the references [brief, page 15]. According to appellant, the examiner's stated reasoning in citing Makram-Ebeid pertains solely to problems or concerns of Makram-Ebeid -- not Catros. Moreover, Catros is concerned with bridging disjointed ends, not merging regions. According to appellant, the skilled artisan would therefore not look to Makram-Ebeid to modify Catros [brief, page 16]. The examiner responds that applying the teachings of Makram-Ebeid to Catros would eliminate a number of contours (interfaces, boundaries, etc.). According to the examiner, Catros' goal of bridging contours would be more easily achieved by applying the teachings of Makram-Ebeid by reducing the number of contours to bridge [answer, page 13].

Appellant also argues that even if Catros and Makram-Ebeid were properly combinable, the references still do not disclose all recited claim limitations, namely (1) weighting the respective shortest path by gradient calculations; (2) associating contours with a respective scale parameter; and (3) determining a scale parameter that minimizes variances between regions defined by the respective contours [brief, pages 18 and 19].

The examiner responds that Catros uses gradient amplitudes in an algorithm to determine the best path to connect a disjointed contour [answer, page 14]. According to the examiner, since these amplitudes are numerical values associated with a gradient, they reasonably teach weight values [id.]. The examiner further notes that Makram-Ebeid teaches eliminating interfaces when a scale parameter increases. Therefore, each eliminated interface has an associated scale parameter at which it exists [id.]. Moreover, the examiner indicates that when two regions are merged in Makram-Ebeid, the function "Energy" is minimized thus likely minimizing intensity variance [answer, pages 14 and 15].

We will sustain the examiner's rejection of claim 20. Makram-Ebeid discloses an algorithm that eliminates the largest possible number of interfaces to ultimately merge adjacent regions with practically identical intensities [Makram-Ebeid, col. 1, lines 43-45]. To this end, the algorithm uses the Energy function that comprises (1) a first term that accounts for intensity variance in each image region, and (2) a second term that accounts for the total length of the image's boundaries, weighted by a scale parameter (λ) [Makram-Ebeid, col. 1, lines 48-53]. Initially, the value "1" is assigned to the scale parameter λ and adjacent regions are merged that minimize the Energy function. The resultant regions are then re-organized and, following a recalculation of the Energy function terms, a new merger attempt is made with $\lambda=1$. This operation is repeated until there is no longer any region with an adjacent region to merge

when the scale factor $\lambda=1$ [Makram-Ebeid, col. 1, lines 60-62]. The scale factor λ is then increased to 2, and the process repeated. Ultimately, the goal of Makram-Ebeid is to merge the regions using the lowest value of the scale parameter λ [Makram-Ebeid, col. 2, lines 8-10]. Thus, as the value of the scale parameter increases, the regions are merged until the Energy function cannot be minimized further [Makram-Ebeid, col. 2, lines 13-15].

In our view, Makram-Ebeid's teaching of eliminating contours is reasonably combinable with the teachings of Catros essentially for the reasons stated by the examiner. Furthermore, we agree with the examiner that Catros' use of gradient amplitudes in an algorithm to determine the most appropriate path to connect a disjointed contour reasonably constitutes numerical values associated with a gradient and therefore weight values.

Furthermore, Makram-Ebeid's goal of merging regions by using the lowest value of the scale parameter λ reasonably suggests selecting an optimal scale parameter from a plurality of scale parameters by determining a scale parameter that minimizes variance between regions as claimed. As noted above, Makram-Ebeid's goal is to merge adjacent regions using the lowest value of the scale parameter λ [Makram-Ebeid, col. 2, lines 8-10]. This teaching strongly suggests that the lowest value of the scale parameter is the optimal scale parameter. And such a scale parameter would also minimize variance between regions via Makram-Ebeid's merging process that ultimately merges adjacent regions with

practically identical intensities [Makram-Ebeid, col. 1, lines 43-45]. The examiner's rejection of claim 20 is proper and is therefore sustained.

Likewise, we will sustain the examiner's rejection of dependent claims 21-23, 31, and 32 under 35 U.S.C. § 103(a) as being unpatentable over the teachings of Catros and Makram-Ebeid. We find that (1) the examiner has established at least a prima facie case of obviousness for these claims on pages 17-20 of the non-final rejection, and (2) appellant has not persuasively rebutted the examiner's prima facie case. The rejection is therefore sustained.

We next consider the examiner's rejection of claim 24 under 35 U.S.C. § 103(a) as being unpatentable over Catros in view of Makram-Ebeid and further in view of Luo. The examiner's rejection finds that Catros and Makram-Ebeid disclose essentially all of the claimed subject matter except a user interface for selecting a width parameter and the two vertices [non-final rejection, pages 20 and 21]. The examiner cites Luo as teaching enabling the user to determine the width and height of a search stripe for video object segmentation. The examiner further notes that Luo teaches that the user can define a video object by specifying its contour [non-final rejection, page 21]. The examiner concludes that it would have been obvious to one of ordinary skill in the art at the time of the invention to modify Catros and Makram-Ebeid to include a user interface to simplify video object segmentation [id.].

Appellant argues that no motivation exists to combine the references [brief, page 19]. Specifically, appellant emphasizes that Catros uses a square

with sides equal to the distance separating the respective points A and B at the ends of the discontinuity [id.]. According to appellant, modifying Catros to accommodate selection via a user interface is contrary to Catros' teachings and therefore teaches away from such a combination [id.]. Moreover, appellant argues that the examiner has provided no objective evidence that Catros suffers from the problems that concern Luo, namely fully automatic image segmentation [reply brief, page 9].

The examiner responds that Catros' width parameter D is part of a search space that is determined automatically [answer, page 15]. The examiner further notes that Luo discloses a search stripe with a width parameter that can be limited by a user. The examiner also notes that Luo expressly provides a motivation to combine the references, namely making image segmentation less difficult [answer, page 15].

We will sustain the examiner's rejection of claim 24. We agree with the examiner that Luo reasonably teaches enabling a user to specify both the width and height of a search stripe for video segmentation. In our view, such a teaching is reasonably combinable with Catros and Makram-Ebeid essentially for the reasons stated by the examiner. Although the search space in Catros is a square, the reference hardly teaches away from providing the ability for a user to define the search space area as appellant alleges. "A reference may be said to teach away when a person of ordinary skill, upon reading the reference, would be discouraged from following the path set out in the reference, or would be led in a

direction divergent from the path that was taken by the applicant.” In re Kahn, 441 F.3d at 990, 78 USPQ2d at 1338 (Fed. Cir. 2006) (quoting In re Gurley, 27 F.3d 551, 553, 31 USPQ2d 1130, 1131 (Fed. Cir. 1994)). Nothing in Catros can be reasonably considered to discourage the skilled artisan from enabling the user to interactively define the search space area as taught in Luo in the cited combination or to lead the skilled artisan in a direction divergent from the path taken by the appellant. At the very least, interactively determining the search space area would provide at least some degree of flexibility in defining the search space in Catros. In our view, combining the teachings of Luo with Catros and Makram-Ebeid is reasonable. The examiner's rejection of claim 24 is therefore sustained.

Lastly, we consider the examiner's rejection of claims 11 and 19 under 35 U.S.C. § 103(a) as being unpatentable over Kim in view of Suzuki and further in view of Kim ('337). We find that the examiner has established at least a prima facie case of obviousness of those claims that appellant has not persuasively rebutted. Specifically, the examiner has (1) pointed out the teachings of Kim, (2) pointed out the perceived differences between Kim and the claimed invention, and (3) reasonably indicated how and why Kim would have been modified to arrive at the claimed invention [non-final rejection, pages 15 and 16]. Once the examiner satisfied the burden of presenting a prima facie case of obviousness, the burden then shifted to appellant to present evidence or arguments that persuasively rebut the examiner's prima facie case. Here, appellant did not

persuasively rebut the examiner's prima facie case. The rejection is therefore sustained.

In summary, we have sustained the examiner's rejection with respect to all of the claims on appeal. Therefore, the decision of the examiner rejecting claims 1-5, 7-14, and 16-36 is affirmed.

No time period for taking any subsequent action in connection with this appeal may be extended under 37 CFR § 1.136(a)(1)(iv).

AFFIRMED

JAMES D. THOMAS
Administrative Patent Judge

Jerry Smith
JERRY SMITH
Administrative Patent Judge

~~LANCE LEONARD BARRY~~
Administrative Patent Judge

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Appeal No. 2006-1618
Application No. 10/046,797

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